Ninth Quarterly Progress Report
April - June 1975)

"A Cloud Physics Investigation Utilizing Skylab Data"

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EREP - 9611

Purchase Order No. T-4715B

Task I - Transmittances

a. Oxygen "A" Band

Calculations using the Lowtran II atmospheric transmission program, the solar spectrum, and the S191 spectral response function were performed to see if the affect mentioned in the 7th Quarterly Progress Report could be explained. Calculations were performed for four sets of conditions. These were solar zenith angles of 60° and 80°, corresponding to atmospheric path lengths of 2 and 5.7 respectively. Heights of 5 km and 0 km were also considered. The calculations do predict the change shown in Figures 1 and 2 of QPR #7. The major contributing factor appears to be the aerosol scattering in the lower atmosphere. The affect is not observed for the 5 km height at all nor for the 60° solar zenith angle, 0 km height case. Molecular scattering with its λ^{-4} dependence also tends to produce the affect.

b. 2.0μm CO_2 Band

The Lowtran II program, S191 spectral response, and solar spectrum are being used to compute the expected absorption by 2.0μm band for a variety of cloud pressure levels and solar zenith angles.

Task II - Scattering Calculations

This task has been completed.

Task III - Cloud Models and Returned Signals

a. Cloud Models

This task has been completed.

b. Returned Signals

Pending completion of Task Ib and a decision as to what analysis procedure will be used for the "A" band data, we plan to combine the results of Tasks I, II, and III with instrument response data and solar spectra to simulate results.

Task IV - Deconvolution Procedure

A deconvolution program was written by Mr. Henry Fleming of SEL for another project and was mentioned in QPR #6 (July-September, 1974). It now appears that the deconvolution technique will not be used, but that integrates absorption by the entire oxygen "A" band will be used in the analysis.

Task V - Background Meteorological Data

No additional background meteorological data was acquired during this reporting period.

Task VI - Analysis of Satellite Data

Analysis of the three long wavelength data channels continued during this reporting period. In addition to wavelength acceptance criterion, it was found necessary to impose a minimum radiance criterion. It was also found necessary to modify the computer program to permit the computation of mean values and standard deviations for selected sub-sets of data on a given tape.

A technique for computing the integrated absorption in the "A" band has been devised. The technique "normalizes the relative maximum at $\sim .78 \mu$m to the solar irradiance curve and then "adjusts" the relative maximum at $\sim .74 \mu$m to fit the solar curve. Intermediate values (i.e., $.74 \leq \lambda \leq .78$ μm) are adjusted accordingly.

During this reporting period anomolous behavior was noted in two of the data analysis programs. This is currently under review.